CLAIMS

1. An electroless copper plating liquid for forming a thin film copper interconnection for a semiconductor device having a filled interconnection structure, characterized by containing dihydric copper ions, a complexing agent, an aldehyde acid, and an organic alkali.

2. An electroless copper plating liquid according to claim 1, characterized by further containing polyoxyethylene alkylphenylether phosphoric acid and/or polyoxyethylene alkylphenylether, which has the structure indicated below, at a concentration ranging from 1 to 100 mg/L:

15

10

(polyoxyethylene alkylphenylether phosphoric acid) $[R(C_6H_4)O(C_2H_4O)_n]_{m} - P - (OH)_{3-m}]$ m = 1 through 3

(polyoxyethylene alkylphenylether)

 $R(C_6H_4)O(C_2H_4O)_{n}H$

20

25

3. An electroless copper plating liquid according to claim 1, characterized in that said complexing agent comprises EDTA·4H (ethylenediaminetetraacetic acid), said aldehyde acid comprises a glyoxylic acid, and said organic alkali comprises TMAH (tetramethylammonium hydroxide).

4. An electroless copper plating liquid according to claim 4, characterized in that said copper ions have a

alkylphenylether phosphoric acid and/or polyoxyethylene alkylphenylether, which has the structure indicated below, at a concentration ranging from 1 to 100 mg/L:

(polyoxyethylene alkylphenylether phosphoric acid)

m = 1 through 3

(polyoxyethylene alkylphenylether)

 $R(C_6H_4)O(C_2H_4O)_nH$

10

15

20

A method of forming a copper interconnection according to claim 8, characterized in that said complexing agent comprises EDTA·4H (ethylenediaminetetraacetic acid), said aldehyde acid comprises a glyoxylic acid, and said organic alkali comprises TMAH (tetramethylammonium hydroxide).

A. A method of forming a copper interconnection according to claim 2, characterized in that said copper ions have a concentration ranging from 0.01 to 10.0 g/L, said EDTA·4H has a concentration ranging from 0.5 to 100 g/L, said glyoxylic acid has a concentration ranging from 1 through 50 g/L, and the electroless copper plating liquid has a pH adjusted to a range from 10 to 14 by said TMAH.

25

10. A method of forming a copper interconnection on a semiconductor device, characterized by performing an electroless copper plating process at a plating rate of 50 nm/min. or less using said electroless copper plating

concentration ranging from 0.01 to 10.0 g/L, said EDTA·4H has a concentration ranging from 0.5 to 100 g/L, said glyoxylic acid has a concentration ranging from 1 through 50 g/L, and the electroless copper plating liquid has a pH adjusted to a range from 10 to 14 by said TMAH.

22

.5. A method of forming a copper interconnection on a semiconductor device, characterized by the steps of forming an auxiliary seed layer for reinforcing a copper seed layer in an interconnection groove defined in a surface of the semiconductor device using an electroless copper plating liquid containing dihydric copper ions, a complexing agent, an aldehyde acid, and an organic alkali, performing an electrolytic plating process using the seed layer including said auxiliary seed layer as a current thereby filling feeding /layer, for copper the interconnection groove defined in the surface the şemiconductor device.

10

20 A method of forming a copper interconnection according to claim , characterized by performing an electroless copper plating process at a plating rate of 50 nm/min. or less using said electroless copper plating liquid.

25

A method of forming a copper interconnection according to claim 5, characterized in that said electroless copper plating liquid contains polyoxyethylene

liquid.

11. A method of forming a copper interconnection on a semiconductor device, characterized by plating copper on a surface of a semiconductor substrate using an electroless copper plating liquid containing dihydric copper ions, a complexing agent, an aldehyde acid, and an organic alkali.

10

5

12 A method of forming a copper interconnection according to claim 11, characterized by performing an electroless copper plating process at a plating rate of 50 nm/min. or less.

faaffs

Add C3>